

CHANGES OF IMMUNOLOGICAL RESISTANCE AS A POSSIBLE CRITERION FOR THE RISK OF THE POPULATION RESIDING INDUSTRIAL ZONE

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The considerable development of our chemical industry resulted in certain pollution of the environment with numerous toxic compounds which are still unknown for the human genetic adaptive system. Substances polluting the atmosphere have much importance. Their peculiarities are the variety of the chemical influence, multifactor activity, low intensiveness, duration of the noxious action (practically severless). All that, of course, makes difficult the evaluation and estimation of the harmful effects and risk for the health of the exposed residents. Therefore, it is very important to research and investigate new parameters and complexes of tests as a criterion for estimation of the health disorders of certain groups of the population. Recent experience shows that the exposed to intensive pollution contingents develop certain disorders of the oxidative-reductive processes and attached weaker points of the metabolic processes of the organism. It is accepted that these processes are usually interpreted as non-specific for they all are registered in zones with considerable, but with certain variety, pollution of the air. Recently, some authors report definite results for a nonspecific-compensatory tension of the adaptation mechanisms of the organism towards the air pollutants and contaminants. It is very possible that together with adaptation processes of the exposed organism could be activated as well other systems contributed to human immunobiologic resistance. All aforementioned was the base of our presumption to carry out this experimental work.

Material and methods

The study covered a representative group of 109 residents of a zone with intensive chemical industry and another one of 73 residents of a control zone without such contamination of the air. The contingent did not vary in sex and age considerably. The following indexes and tests for estimation of the immunobiologic status were applied: serum bactericidity (SB) after the method of Smirnoff, complement serum activity (CSA) after Nazarenko and Zinoff, serum immunoglobulin content (SIC) after the method of Mancini. A simultaneous study of the morbidity of the population (MP) from both zones was carried out. All results were worked statistically after the method of variation analysis (VA) and the registered differences were estimated by "t" criterion of Student & Fischer.

Results and discussion

Table 1 shows the results of SB and CSA for all studied individuals from both zones, as well as separately due to sex division. The latter has no statistical significance concerning the investigated parameters. Considerable decrease of

Table 1

Changes of the levels of unspecific immunobiological indices of representative groups

Unspecific immunobiological indices	Population			
	Males		Females	
	industrial zone	control zone	industrial zone	
	n=51	n=20	n=58	
Statistical criterion	$\bar{x} \pm Sx$	$x \pm Sx$	P	$\bar{x} \pm Sx$
Serum bactericidity in %	91,01 ± 1,36	94,47 ± 1,46	>0,05	90,86 ± 1,66
Serum complementary activity in haemolytic units	75,74 ± 2,75	87,27 ± 4,34	<0,05	72,07 ± 2,43

CSA for the risk group (zone of chemical pollution) is established. It is already known that the complement system consists of 11 protein components; the latter react with an increased or decreased synthesis due to exogenic or endogenic activations. Those changes in such a multi-component system of biologically active proteins with a polytrophic origin perhaps play certain role in the adaptive and defensive reactions of the organism. The complement system takes part in various cytological, bacteriological, anaphylactic and allergic reactions. The components are activated in all immune reactions in a definite sequence. The disorders of the synthesis or activation of any of the complement components probably has influence upon the resistant complexes of the organism and increased affinity towards various pathogenic agents. The changes of the complement activity interact with the total SB; D. Zograffov (1971) accepts that lower level of complement tends to lower level of SB. Our data coincide with those results and presumption: 75 % of the residents from the control zone show a similarity in that aspect. However, from the other investigated contingent, that of the zone with chemical industry, certain dissociation between CSA and SB was established with 62 % of the studied inhabitants. Though there was some counteraction of the changes of the studied indexes, the average values of SB of residents from the industrial zone were considerably lower ($p < 0.05$) then those of the controls. This is probably connected with a regulatory balance of the forthcoming changes of the synthesis of nonspecific immunoproteins. The registered concentrations of immunoglobulins in the serum of our contingents are shown on fig. 1. The presented results of the control group are in (or about) the area of normal physiology, whereas those of the experimental group are at the upper border of physiology deviations. Although the fact, due to a considerable grouping of the values, there are statistically established differences between both contingents under our study. We have to point out, however, that concerning residents from the chemical pollution zone, the values of some immunoglobulins are over physio-

logical area: IgG (28.6), IgA (8.18 %) and IgM (9.35 %). These results suggest an intensive synthesis of antibodies in the organisms of the exposed inhabitants and confirm the tension of their adaptation and resistant mechanisms directed towards recreation and support of the homeosynthesis. The conditions of the newly-created chemical influence require a quick resetting of the organism and

of population in chemical industry zone

groups				
control zone	United group			
	industrial zone		control zone	
n=53	n=109		n=73	
$\bar{x} \pm Sx$	P	$\bar{x} \pm Sx$	$\bar{x} \pm Sx$	P
94,23 ± 1,00	< 0,05	90,92 ± 1,18	94,02 ± 0,81	< 0,05
83,24 ± 2,55	< 0,001	73,84 ± 1,54	84,33 ± 2,19	< 0,001

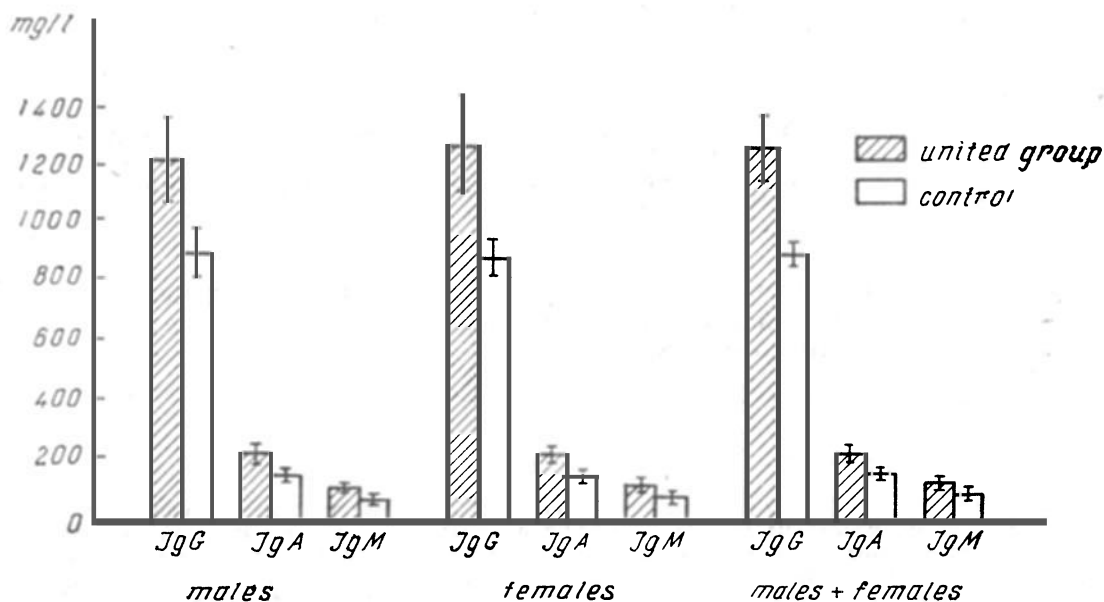


Fig. 1

a bigger or lower tension of the adaptive mechanisms. The total adaptation of the organism can be realized by participation of the central regulatory mechanisms connected with the pathogenesis of the actual intoxication and corresponding pollutants. As a result, due to the changes of the complex of factors, whose

mutual activity and interaction contribute to the immunobiological resistance of the organism, certain adaptation of the affected organism could be achieved.

The aforementioned tension of compensatory mechanisms directed towards an equilibrium with the "chemical blockade", different from the homeostasis, can be probably qualified as a heterostatis (or "compensatory adaptation"), based on the qualificative classification of T. Popov (1977). In such conditions the received balance (equilibrium) can be easily changed by certain pathological influences. The results of the analysis of total morbidity of residents under study confirm our opinion: the frequency of the acute infections of the upper respiratory tract (AIURT) is 4 times higher in the zone of chemical industry than that in the control zone. The structure of MP, analysed also retrogradely concerning infections of the eyes and skin, shows twice higher frequency in the chemical zone. Bronchitis and pneumonia are 3—4 times oftener in the zone of chemical pollution than in the control one. All that proves the decreased resistance towards various infections with the residents of the dangerous zone and undoubtedly depicts the registered in our study disorganization of the immunobiological defence of the organism.

The analysis of the received data and their comparison to some clinic-laboratory parameters and results of MP allow the following conclusion: the indexes of the immunobiological status of the organism can be used as a criterion for estimation of the risk of nonspecific infections, located in the respiratory tract, conjunctiva, skin and its sublayers, etc.

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ИЗМЕНЕНИЯ ИММУНОЛОГИЧЕСКОЙ РЕЗИСТЕНТНОСТИ — КРИТЕРИЙ ОЦЕНКИ РИСКА ЗАБОЛЕВАЕМОСТИ НАСЕЛЕНИЯ ПРОМЫШЛЕННОГО РАЙОНА

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РЕЗЮМЕ

Для оценки влияния загрязненного атмосферного воздуха на иммунологическое состояние организма проведены исследования 109 лиц, живущих в районе с развитой химической промышленностью и 73 лиц, живущих в районе без существенного загрязнения атмосферного воздуха. Используются следующие показатели: бактерицидность сыворотки, комплиментарная активность и содержание иммуноглобулинов в сыворотке. Изучена также заболеваемость населения указанных районов.

Анализ полученных результатов и их сопоставление с некоторыми клинико-лабораторными показателями, а также с данными заболеваемости, дают основание считать, что показатели иммунологического состояния организма могут служить критерием оценки риска неспецифических и инфекционных заболеваний дыхательных путей, конъюнктивитов, кожи и подкожной ткани.